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EXAMINER	
ROSALES HANNER, MORELLA I	
ART UNIT	**PAPER NUMBER**
2128	4

DATE MAILED: 06/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/667,924	SCHULTZ, PAUL	
	Examiner	Art Unit	
	Morella I Rosales-Hanner	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 September 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 - 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☑ Claim(s) 1-20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 September 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

1. **Claims 1 – 20** are pending and have been examined.

Drawings

2. **Figure 1** should be designated by a legend such as --**Prior Art**-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. **Figures 1, 2, 3A, and 3B** are objected to because they contain hand written labels that are difficult to read. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

4. **Claim14** is objected to because of the following informalities: line 4 of the claim recites '...inputting data that describe **at least one of**...' followed by a list of input data wherein the last element of the list is preceded [line 8] by '**and**'. It appears that the last element of the list of input data should be preceded by '**or**'. Appropriate correction is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6.1 **Claims 1 – 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over a printed publication by Curtner et al. titled "**Simulation-Based Features of the Compressed Air System Description Tool,, XCEED**", hereafter referred to as *Curtner*, in view of **U.S. Patent No. 6,036,449** issued to Nishar et al, hereafter referred to as *Nishar*, in further view of **U.S. Patent No. 6,477,518** issued to Li et al, hereafter referred to as *Li*.

6.1.1 **Claim 1** is drawn to a method of designing a vehicle air system comprising:

- using a computer to simulate operation of a proposed vehicle air system over a time period, said proposed vehicle air system comprising an air compressor and a pneumatically operable device;
- calculating a duty cycle of said air compressor over said time period; <u>and</u>
- outputing said duty cycle.

Curtner teaches **[Pg 1, left Col, 1st paragraph]** a software tool for simulation of compressed air system that:

- allows engineers to create simulations of user-specified (proposed) compressed air systems;
- aids in capturing and manipulating information about an entire compressed air system in order to perform design and tradeoff analysis; and
- provides standardized reports and assessments (output) of compressed air system features **[Pg 2, right Col, feature 7]**

Curtner does not express~~iv~~ely teach simulating a vehicle air system, comprised of an air compressor and a pneumatically operable device, over a period of time, calculating the air compressor's duty cycle over a time period.

Nishar teaches **[Col 2, lines 20 – 35]** a air compressor system which provides air to a vehicle's air powered (pneumatically operable) devices such as service brakes, air suspension, windshield wipers, etc. *Nishar* further teaches **[Col 6, lines 11 - 14]** monitoring air compressor parameters such as duty cycle, cycle time, wet tank pressure and service break events of the air compressor.

Li teaches **[Col 1, lines 17 – 29]** that automotive vehicle design has advanced to a state in which computer-aided design techniques are frequently utilized to develop the new vehicle in a virtual environment and that computer-aided design is especially beneficial in optimizing the various systems incorporated within a vehicle, to maximize design and functional capabilities of the vehicle systems.

It would have been obvious to one of ordinary skills in the art, at the time of the invention, to modify the compressed air system simulation software tool as taught by *Curtner* to simulate a vehicle air compressor system comprised of an air compressor and air powered (pneumatic) devices as taught by *Nishar* to utilized computer-aided design techniques that are beneficial in the optimization of the various systems incorporated within a vehicle in order to maximize design and functional capabilities of the vehicle system under design as taught by *Li*.

6.1.2 **Claim 2 is drawn to:**

- comparing said duty cycle to a predefined threshold; <u>and</u>
- recommending modifications to said proposed vehicle air system if said duty cycle exceeds said threshold.

Curtner teaches **[Pg 1, left Col, 2nd paragraph]** a software tool that allows engineers to construct simulations, perform design and tradeoff analysis of compressed air systems.

Curtner does not expressly teach comparing compressor's duty cycle to a predefined threshold and recommending modifications to the proposed air system if the duty cycle exceed said threshold.

Nishar teaches a method **[Col 3, lines 29 - 33]** wherein a given mode of the air compressor is maintained for a predetermined period of time when the air compressor is operating between predetermined pressures (threshold) to prevent excessive cycling of the air compressor.

Li teaches [**Col 7, lines 55 - 67**] a method that evaluates a preliminary design using an analysis tool, compares the results of the evaluation to predetermined performance criteria (threshold), and if the analysis does not meet the predetermined performance criteria the method revises the characteristics of the preliminary design. *Li* further teaches [**Col 1, lines 48 – 60**] that it is known that knowledge-based design methods are being utilized in designing vehicle systems that provide advice, to the user of the method, learned from knowledge guidelines based on lessons learned from previous designs, and engineering and manufacturing experience and that advantageously, knowledge-based design techniques maximize the amount of knowledge utilized, while developing new vehicle systems in a minimal period of time.

It would have been obvious to one of ordinary skills in the art, at the time of the invention, to modify the compressed air system simulation software tool as taught by *Curtner* to monitor compressor cycling during a predetermined period of time, as taught by *Nishar*, and comparing an evaluation of a preliminary design of the air supply system, using an analysis tool, to a predetermined performance criteria and providing advice/revising the preliminary design characteristics if the analysis does not meet the predetermined design characteristics in order to develop a new vehicle system in a minimal period of time as taught by *Li*.

6.1.3 **Claim 3** is drawn to a time period that is equal to an average period of time that said proposed vehicle air system is expected to be operated per day.

Curtner teaches **[Pg 6, Table 2 and corresponding text]** component models that provide enough dynamic fidelity to model compressed air system transients to assess an existing system. Particularly, a Loads component that models user-selectable time profile as well as different variations of load flows.

Curtner does not expressly teach a user-selectable time profile that is equal to an average period of time the proposed vehicle air system is expected to be operated per day.

Nishar teaches **[Col 8, lines 32 – 64]** assessing the compressed air system performance under various traveling conditions over an average period of time in order to identify service diagnostics, such as air leaks as well as vehicle operating characteristics.

Li teaches **[Fig. 6 and corresponding text]** a computational fluid dynamics (CFD) module that simulates the performance of a chosen design to ensure that performance criteria, such as rules, guidelines or specifications are satisfied.

It would have been obvious to one of ordinary skills in the art, at the time of the invention, to model a proposed compressed air system using the Load component taught by *Curtner* to assess the air system performance, over an average period of time and under various traveling conditions to identify service diagnostics and vehicle operating characteristics, as taught by *Nishar*, and to ensure that performance criteria are satisfied as taught by *Li*.

6.1.4 As regard to **claims 4 and 5**, **claim 4** is drawn to a method of simulating operation of a proposed vehicle air system over a time period that includes:

- simulating selective operation of said air compressor to add air to said proposed vehicle air system; <u>and</u>
- simulating selective operation of said pneumatically operable device to exhaust air from said proposed vehicle air system.

While **claim 5** is drawn to inputting vehicle use information that describes expected operation conditions of the proposed vehicle air system over a time period.

Curtner teaches **[Pg 3, left Col, 3rd paragraph]** engineering analysis tools to assist in the calculation/determination of compressed air system capacitance, mass properties, pressure drop calculations and other engineering quantities that are combined into a system of equations relating the components of the air system. *Curtner* also teaches **[Pg 4, left Col, 3rd paragraph]** simulations that are created by selecting compressed air objects along with user-supplied object parameterization information and simulation definition information such as duration and outputs desired. *Curtner* further teaches a demonstration window use to convey the state of the air system in terms of compressor power and flow, storage capacity depletion, supply piping pressure loss and load consumption.

Curtner does not expressly teach selective operations of the system's components, such as the air compressor or a pneumatically operable device, to exhaust from /replenish air to the vehicle air system.

Nishar teaches **[Col 6, lines 9 - 14]** monitoring parameters such as air compressor duty cycle, cycle time, wet tank pressure and service break events to aid in the diagnosis of air leaks and unusual braking patterns in order to increase the life of the air compressor.

Li teaches **[Col 8, lines 52 – 64]** that in addition to the analysis of data such as duty cycle of the compressor, length of cycles, total compressor pump operating time and reservoir pressure change rates, all parameters which can be readily derived from the ECU can provide valuable information relating to service diagnostics for warranty purposes. *Li* further teaches that by monitoring the duty cycle of the air compressor, unusual activities indicating air leaks in the compressed air system can be identified such leaks in the vehicles air system can cause the air compressor to run more often than necessary and for longer periods of time thus reducing the fuel economy and increasing the overall power consumption of the air compressor rendering the vehicle more expensive to operate.

It would have been obvious to one of ordinary skills in the art, at the time of the invention, to simulate a proposed vehicle air system by selecting compressed air objects along with user-supplied object parameterization and simulation definition simulation, as taught by *Curtner,* to identify air leaks and unusual braking patterns, as taught by *Nishar,* in order to identify and avoid vehicle air system configurations that reduce the fuel economy and increase the overall power consumption associated which operating the system as taught by *Li.*

6.1.5 As regard to **claims 6 - 8,** these claims are drawn to a pneumatically operable device comprising a pneumatic suspension, service brakes, windshield wipers, etc., and wherein said vehicle use information includes expected road roughness information, brake application pressure information and climate wetness information.

Curtner teaches **[Pg 4, left Col, 3rd paragraph]** simulations that are created by selecting compressed air objects along with user-supplied object parameterization information and simulation definition information such as duration and outputs desired.

Curtner does not expressly teach simulation different pneumatically operable devices such as, air suspension, pneumatic brakes or windshield wipers.

Nishar teaches **[Col 1, lines 11 -15]** that modern vehicles contain air compressors which are used to charge an air tank from which air-powered systems, such as service brakes, windshield wipers, air suspension, etc., can draw air. *Nishar* also teaches: assessing the performance of a proposed air compressor system following several different driving and road conditions **[Col 8, lines 10 - 36]**, break application pressure information **[Col 5, lines 37 – 56]**, and an air dryer which primarily functions as a desiccant which removes moisture from the compressed air **[Col4, lines 41 – 44]**.

Li teaches **[Col 7, lines 35 - 45]** evaluation of a preliminary model by comparing it to design or performance expectations.

It would have been obvious to one of ordinary skills in the art, at the time of the invention, to create compressed air simulations using object parameterized and simulation definition information, as taught by *Curtner*, to simulate a vehicle's air-

powered system such as service brakes, windshield wipers, air suspension, etc. using different driving and road conditions, break pressure and air dryer information, as taught by *Nishar* to ensure that the proposed system meets design or performance expectations as taught by *Li*.

6.1.6 As regard to independent **claims 9 and 18** and dependent **claims 10, 12, 14, 15,** these claims are drawn to a method for predicting performance of a vehicle air system comprising:

- Inputting into a computer data that simulate a proposed vehicle air system, including:
  - (i) data that describe a simulated air compressor of the proposed vehicle air system; and
  - (ii) data that describe a simulated pneumatically operable device of said proposed vehicle air system;
- using said computer to simulate operation of said proposed vehicle air system over a simulation time period, said simulation operation including:
  - (i) selectively simulating exhaustion of air from said proposed vehicle air system in response to simulated operation of said pneumatically operable device; <u>and</u>
  - (ii) selectively simulating addition of air to said proposed vehicle air system in response to simulated operation of said air compressor; and,

- outputting data from said computer that describe said simulated operation of said proposed vehicle air system such as the compressor duty cycle.

Curtner teaches **[Pg 4, left col, 3rd paragraph]** a method of simulating and modeling (predicting) the performance of a compressed air system comprising:

- inputting data describing a simulated air compressor as part of the proposed vehicle air system **[Pg 4, Left Col, 2nd & 3rd paragraph]** and allowing users to create new specialized component models **[Pg 2, Technical Basis section]**;
- using a computer to simulate a proposed compressed air system **[Pg 4, Conclusion section]**; and
- providing standardized reports and assessments (output data) of compressed air system features **[Pg 2, Technical Basis section]**.

Curtner does not expressly teach inputting data describing simulating a vehicle air system, simulating a pneumatically operable device or selectively simulating addition of air to the proposed compressed air system in response to simulating the operation of the proposed system's air compressor.

Nishar teaches **[Col 2, lines 20 – 35]** an air compressor system which provides air to a vehicle's air powered (pneumatically operable) devices such as service

brakes, air suspension, windshield wipers, etc,. *Nishar* also teaches [**Col 6, lines 9 - 14**] monitoring parameters such as air compressor duty cycle, cycle time, wet tank pressure and service break events to aid in the diagnosis of air leaks and unusual braking patterns in order to increase the life of the air compressor. *Nishar* further teaches [**Col 8, lines 10 - 36**] assessing the performance of a proposed vehicle compressed air system following several different driving and road conditions, break application pressure information and air dryer functionality.

Li teaches [**Col 1, lines 17 – 29**] that automotive vehicle design has advanced to a state in which computer-aided design techniques are frequently utilized to develop the new vehicle in a virtual environment and that computer-aided design is especially beneficial in optimizing the various systems incorporated within a vehicle, to maximize design and functional capabilities of the vehicle systems. *Li* also teaches [**Col 8, lines 52 – 64**] that in addition to the analysis of data such as duty cycle of the compressor, length of cycles, total compressor pump operating time and reservoir pressure change rates, all parameters which can be readily derived from the ECU can provide valuable information relating to service diagnostics for warranty purposes. *Li* further teaches that by monitoring the duty cycle of the air compressor, unusual activities indicating air leaks in the compressed air system can be identified such leaks in the vehicles air system can cause the air compressor to run more often than necessary and for longer periods of time thus reducing the fuel economy and increasing the overall power consumption of the air compressor rendering the vehicle more expensive to operate.

It would have been obvious to one of ordinary skills in the art, at the time of the invention, to modify the compressed air system software simulation tool as taught by *Curtner* to predict the performance of a vehicle compressed air system comprising an air compressor and air powered (pneumatic) devices and monitor parameters such as air compressor duty cycle, cycle time, air dryer performance, wet tank pressure and service break events to aid in the diagnosis of air leaks and unusual braking patterns in order to increase the life of the air compressor as taught by *Nishar* thus to maximizing the design and functional capabilities vehicle systems as taught by *Li*.

6.1.7 **Claim 11** is drawn to the method of predicting the performance of a vehicle air system further comprising:

- comparing said duty cycle to a predefined threshold; and,
- recommending modification of said proposed vehicle air system if said duty cycle exceeds said threshold.

Curtner teaches **[Pg 1, left Col, 2nd paragraph]** a software tool that allows engineers to construct simulations, perform design and tradeoff analysis of compressed air systems.

Curtner does not expressly teach comparing compressor's duty cycle to a predefined threshold and recommending modifications to the proposed air system if the duty cycle exceed said threshold.

Nishar teaches a method **[Col 3, lines 29 - 33]** wherein a given mode of the air compressor is maintained for a predetermined period of time when the air compressor is operating between predetermined pressures (threshold) to prevent excessive cycling of the air compressor.

Li teaches **[Col 7, lines 55 - 67]** a method that evaluates a preliminary design using an analysis tool, compares the results of the evaluation to predetermined performance criteria (threshold), and if the analysis does not meet the predetermined performance criteria the method revises the characteristics of the preliminary design. *Li* further teaches **[Col 1, lines 48 – 60]** that it is known that knowledge-based design methods are being utilized in designing vehicle systems that provide advice, to the user of the method, learned from knowledge guidelines based on lessons learned from previous designs, and engineering and manufacturing experience and that advantageously, knowledge-based design techniques maximize the amount of knowledge utilized, while developing new vehicle systems in a minimal period of time.

It would have been obvious to one of ordinary skills in the art, at the time of the invention, to modify the compressed air system simulation software tool as taught by *Curtner* to monitor compressor cycling during a predetermined period of time, as taught by *Nishar*, and comparing an evaluation of a preliminary design of the air supply system, using an analysis tool, to a predetermined performance criteria and providing advice/revising the preliminary design characteristics if the analysis does not meet the

predetermined design characteristics in order to develop a new vehicle system in a minimal period of time as taught by *Li*.

6.1.8 **Claim 13** is drawn to inputting data that describe a simulated air dryer of said proposed vehicle air system.

Curtner teaches a compressed air simulation tool comprising a component window **[Fig 2 and corresponding text]** within which a user selects and parameterizes the components of the compressed air system and that allows "super-users" to create new or specialized component models.

Curtner does not expressly teach inputting data to describe a simulated air dryer of the proposed compressed air system.

Nishar teaches **[Fig 1 and corresponding text]** a vehicle air system comprising an air dryer and that the air dryer primarily functions as a desiccant which removes moisture from the compressed air in order to prevent downstream freeze ups and corrosion of the air lines, air tanks and valving components. The dryer also functions as a sump for oil and air contaminants, which in effect increases the life of the air system.

Li teaches **[Col 3, lines 27 – 38]** a method of designing a vehicle system that uses a generic parametric driven design process and that the advantage of this approach is that allows flexibility in vehicle design and engineering analysis of the design in a fraction of the time required using conventional design methods.

It would have been obvious to one of ordinary skills in the art, at the time of the invention, to modify the compressed air simulation tool as taught by *Curtner* to

accept input data to simulate the operation of an air dryer component to identify its impact on the proposed vehicle compressed air system as taught by *Nishar* to take advantage of the flexibility of using a parametric driven design process in order to reduce the time required to design and perform engineering analysis of a vehicle compressed air system as taught by *Li*.

6.1.9 **Claims 16 - 17 and 19 - 20** are drawn to the step of inputting data that describe proposed use of said vehicle comprising inputting data that describe at least one of:

- road surface roughness encountered by said vehicle;
- a number of stops per day of use of said vehicle;
- a number of parking brake applications per day of use of said vehicle;
- environmental wetness conditions encountered by said vehicle;
- a number of gear shifts performed by said vehicle;
- a number of door open/close cycles performed by said vehicle; and
- a number of kneel cycles performed by said vehicle.

Curtner teaches **[Pg 4, left Col, 3rd paragraph]** simulations that are created by selecting compressed air objects along with user-supplied object parameterization information and simulation definition information such as duration and outputs desired.

Curtner does not expressly teach simulation different pneumatically operable devices such as, air suspension, pneumatic brakes or windshield wipers.

Nishar teaches **[Col 1, lines 11 -15]** that modern vehicles contain air compressors which are used to charge an air tank from which air-powered systems,

such as service brakes, windshield wipers, air suspension, etc., can draw air. *Nishar* also teaches: assessing the performance of a proposed air compressor system following several different driving and road conditions [**Col 8, lines 10 - 36**], break application pressure information [**Col 5, lines 37 – 56**], and an air dryer which primarily functions as a desiccant which removes moisture from the compressed air [**Col4, lines 41 – 44**].

Li teaches [**Col 7, lines 35 - 45**] evaluation of a preliminary model by comparing it to design or performance expectations.

It would have been obvious to one of ordinary skills in the art, at the time of the invention, to create compressed air simulations using object parameterized and simulation definition information, as taught by *Curtner*, to simulate a vehicle's air-powered system such as service brakes, windshield wipers, air suspension, etc. using different driving and road conditions, break pressure and air dryer information, as taught by *Nishar* to ensure that the proposed system meets design or performance expectations as taught by *Li*.

Additional Information

7. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Morella Rosales-Hanner whose telephone number is (703) 305-8883. The examiner can normally be reached Monday-Friday from 7:00 a.m. to 3:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on 703 305-9704. The fax number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

MRH

June 10th, 2004

HUGH JONES Ph.D.
PRIMARY PATENT EXAMINER
TECHNOLOGY CENTER 2100